

REMARKS

The Office Action dated March 3, 2009 has been received and carefully noted. The following remarks are submitted as a full and complete response thereto. Claims 1-5, 8-12, 15-20, and 25-26 are currently pending in the application and are respectfully submitted for consideration.

The Office Action rejected claims 1-4, 8-12, 15, 17-18, 20, and 25-26 under 35 U.S.C. §102(e) as being anticipated by Hunton (U.S. Patent No. 7,095,798). This rejection is respectfully traversed for at least the following reasons.

Claim 1, upon which claims 2-7 are dependent, recites a method which includes generating a residual signal from a multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal. The method also includes applying a least squares function to the residual signal for at least one carrier of the multi-carrier signal, thereby generating a minimized residual signal for the at least one carrier, and combining the minimized residual signals and the multicarrier signal.

Claim 8, upon which claims 9-14 are dependent, recites an apparatus comprising a generator configured to generate a residual signal from a multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal. The apparatus also includes an applying unit configured to apply a least squares function to the residual signal for at least one carrier of the multi-carrier

signal, thereby generating a minimized residual signal for the at least one carrier. The apparatus also includes a combining unit configured to combine the minimized residual signals and the multicarrier signal.

Claim 15, upon which claim 16 is dependent, recites a system comprising a transmitter apparatus configured to reduce a peak-to-mean ratio of a multi-carrier signal, a generating unit configured to generate a residual signal from a multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal. The mobile communication system also includes an applying unit configured to apply a least squares function to the residual signal for at least one carrier of the multi-carrier signal, thereby generating a minimized residual signal for the at least one carrier, and a combining unit configured to combine the minimized residual signals and the multicarrier signal.

Claim 17 recites an apparatus including generating means for generating a residual signal from a multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal. The apparatus also includes applying means for applying a least squares function to the residual signal for at least one carrier of the multi-carrier signal, thereby generating a minimized residual signal for the at least one carrier, and combining means for combining the minimized residual signals and the multicarrier signal.

Claim 18 recites a system including transmitting means for reducing a peak-to-mean ratio of a multicarrier signal, and generating means for generating a residual signal from

the multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal. The mobile communication system further includes applying means for applying a least squares function to the residual signal for at least one carrier of the multi-carrier signal, thereby generating a minimized residual signal for the at least one carrier, and combining means for combining the minimized residual signals and the multicarrier signal.

Therefore, embodiments of the present invention relate to the reduction of the peak-to-mean average amplitude in a signal transmitted in a power amplifier, and particularly, but not exclusively, to such reduction in the power amplifier of a multicarrier communication system utilizing an EDGE clipper. Embodiments of the present invention apply a least squares function in order to minimize a cost function with respect to the signal properties that must be maintained and the amount of clipping required for a residual signal that can be used to reduce signal peaks in the composite signal. The use of the least squares function allows embodiments of the present invention to be used in relation to EDGE systems.

As will be discussed below, Hunton fails to disclose or suggest all of the elements of the claims, and therefore fails to provide the advantages and features discussed above.

Hunton discloses a system and method for post filtering peak power reduction in multi-carrier communications systems. The system includes a plurality of communication signal sources each providing a band limited communication signal. A plurality of frequency converters offset the frequency of the plural band limited

communication signals and a first combiner combines the plural frequency offset band limited communication signals to form a band limited multi-carrier communication signal. A peak reduction unit is coupled to receive the band limited multi-carrier communication signal and provide a band limited peak reduced multi-carrier output signal. The peak reduction unit comprises a peak reduction calculation circuit for providing a peak reduction correction signal determined from the communication signal and a signal peak limit value, a plurality of correction filters for filtering the peak reduction correction signal and providing a plurality of band limited peak reduction correction signals, and a second combiner for combining the band limited multi-carrier communication signal and the plurality of band limited peak reduction correction signals to provide a peak reduced multi-carrier output signal band limited in plural bands.

Applicants respectfully submit that Hunton fails to disclose or suggest all of the elements of the present claims. For example, Hunton does not disclose or suggest, at least, “applying a least squares function to the residual signal,” as recited in claim 1 and similarly recited in claims 8, 15, 17, and 18.

Rather, Hunton merely discloses that the filtered correction signal V_F signal power should be kept to a minimum to avoid degrading overall system communication quality (Hunton, Column 9, lines 45-56). The Office Action interpreted this minimizing of “the V_F signal power as a least squares function to generate a minimized residual signal” (Office Action, page 3). Applicants respectfully disagree with this interpretation. Minimizing power is not the same as applying “*a least squares function*” to the residual

signal. A least squares function is a particular and specific function or algorithm. Hunton fails to disclose or suggest the application of a least squares function. In addition, in the Office Action of September 3, 2008, it was admitted and acknowledged that "*Hunton fails to disclose applying a least square function to the residual signal*" (Office Action dated September 3, 2008, page 5).

Furthermore, even if the term "applying least square function to a signal" could be considered to correspond to minimizing signal power (which is not admitted), the present independent claims recite that the least squares function is applied to the residual signal; Hunton does not disclose a residual signal and, consequently, Hunton cannot disclose applying a function to a residual signal. In Hunton, V_F is the signal which emanates from a correction circuit and, therefore, is obtained from a signal peak suppression unit. The present independent claims clearly recite that the least squares function is applied to a signal which is the difference between the carrier signal and the hard-clipped signal. Therefore, V_F of Hunton is not a difference signal.

As a result, Hunton also fails to disclose or suggest "generating a residual signal from a multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal," as recited in claim 1 and similarly recited in claims 8, 15, 17, and 18. In particular, Applicants submit that Hunton does not disclose generating a residual signal which is the difference between the multicarrier and hard-clipped multicarrier signals. Although Hunton appears to mention peak suppression, Hunton fails to provide any teaching of determining the difference

between a signal and the hard-clipped version of the signal, i.e., subtracting a hard-clipped signal from another (multicarrier) signal. In Hunton, the peak suppression signal is added to the signal at 130 (combined at combiner 130). In embodiments of the present invention, on the other hand, the peak suppression signal is subtracted from the carrier signal.

Accordingly, Applicants respectfully submit that Hunton fails to disclose or suggest all of the elements of claims 1, 8, 15, 17, and 18. For instance, Hunton fails to disclose or suggest, at least, “generating a residual signal from a multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal,” and “applying a least squares function to the residual signal for at least one carrier of the multi-carrier signal, thereby generating a minimized residual signal for the at least one carrier.”

Claims 16 and 19 were rejected under 35 U.S.C. §103(a) as being unpatentable over Hunton in view of Wright (U.S. Patent No. 7,061,990). The Office Action took the position that Hunton discloses all of the elements of the claims, with the exception of a multi-carrier wireless communication system including an enhanced data GSM system. The Office Action then cited Wright as allegedly curing the deficiency in Hunton. This rejection is respectfully traversed for at least the following reasons.

Hunton is outlined above. Wright discloses a method and apparatus for reducing a peak to average signal level exhibited by single or by multicarrier multibearer waveforms.

Claims 16 and 19 are dependent upon claims 15 and 18, respectively. As discussed above, Hunton fails to disclose or suggest all of the elements of claims 15 and 18. Furthermore, Wright fails to cure the deficiencies in Hunton, as Wright also fails to disclose or suggest “generating a residual signal from a multicarrier signal, the residual signal representing a difference between the multicarrier signal and a hard-clipped multicarrier signal,” and “applying a least squares function to the residual signal for at least one carrier of the multi-carrier signal, thereby generating a minimized residual signal for the at least one carrier.” Therefore, the combination of Hunton and Wright fails to disclose or suggest all of the elements of claims 16 and 19. In addition, claims 16 and 19 should also be allowed for at least their dependence upon claims 15 and 18, and for the specific limitations recited therein.

For at least the reasons discussed above, Applicants respectfully submit that Hunton and Wright, whether considered individually or combined, fail to disclose or suggest all of the elements of the claimed invention. These distinctions are more than sufficient to render the claimed invention unanticipated and unobvious. It is therefore respectfully requested that all of claims 1-5, 8-12, 15-20, and 25-26 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned representative at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,



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